

ARSET

Applied Remote Sensing Training

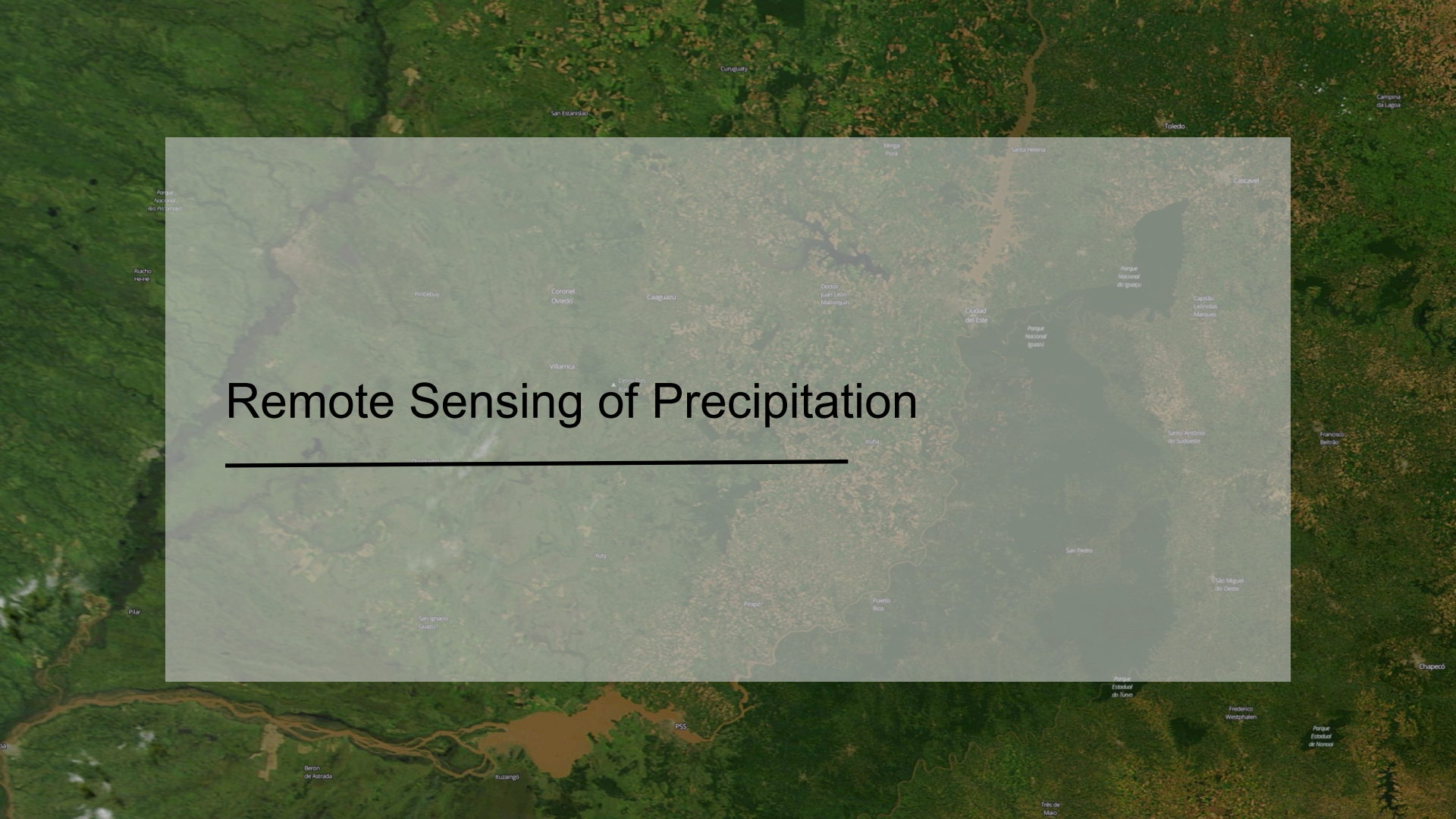
<http://arset.gsfc.nasa.gov>

 @NASAARSET

Overview and Access to GPCP, TRMM, and GPM Precipitation Data Products

Outline

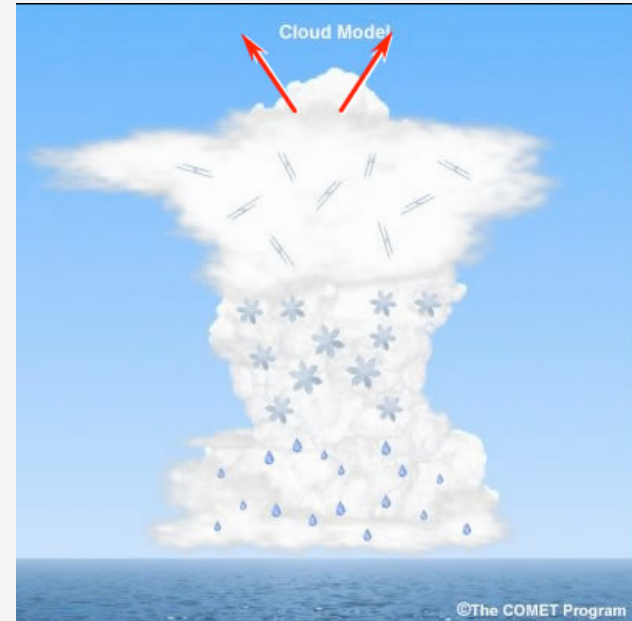
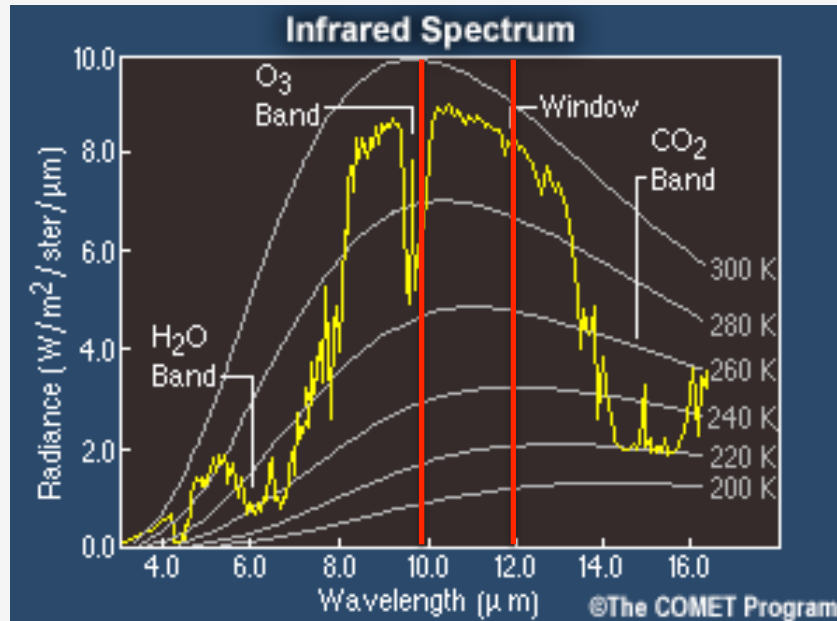
- Remote Sensing of Precipitation
- Global Precipitation Climatology Project (GPCP)
- Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurements (GPM) Missions
- TRMM and GPM Data Products
- TRMM/GPM Data Access: Demonstration of Precipitation Processing System/ STORM

A satellite map of a tropical region, likely in Central America, showing dense green forest, brown rivers, and some cleared land. A semi-transparent light gray rectangular box is centered over the map. Inside this box, the title "Remote Sensing of Precipitation" is written in a large, black, sans-serif font. Below the title, a solid black horizontal line extends from the left edge of the box towards the center. Various place names are visible on the map, both inside and outside the box, including San Estanislao, Comayagua, Toledo, Cancun, Villavieja, Coronel Ovando, Caaguazú, Doctor Juan León Milla, Ciudad del Este, Parque Nacional Iguazú, Capitán Leóndis Marqués, San Antonio de Surubare, Francisco Beltrán, San Pedro, San Miguel de Costa, Puerto Rico, Piapó, Yuty, San Ignacio Guazú, Pilar, Berón de Astrada, Ruzangó, PSS, Trío de Maio, Parque Estadual do Itaipu, Frederico Westphalen, and Parque Estadual de Itaipu. The text "Parque Nacional do Pico Marumbi" and "Rio Heine" are also visible on the left side of the box.

Remote Sensing of Precipitation

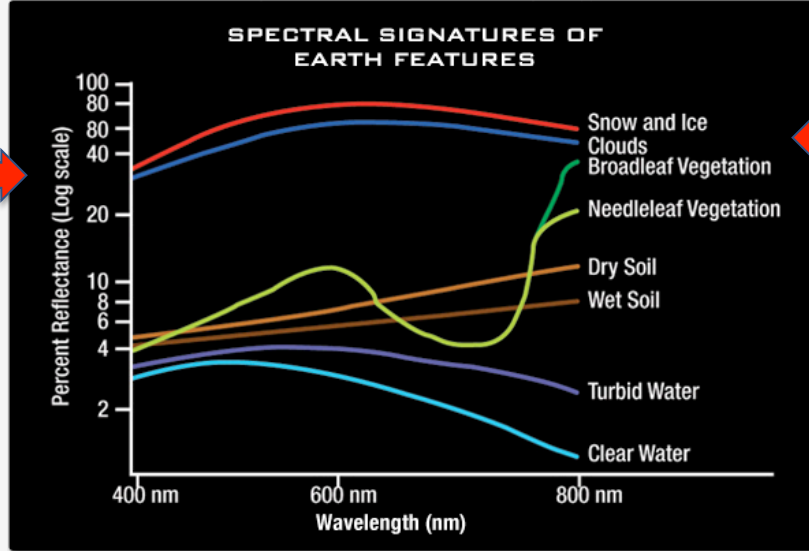
Precipitation Remote Sensing

Passive Remote Sensing: Inferred indirectly from emitted infrared radiation by clouds

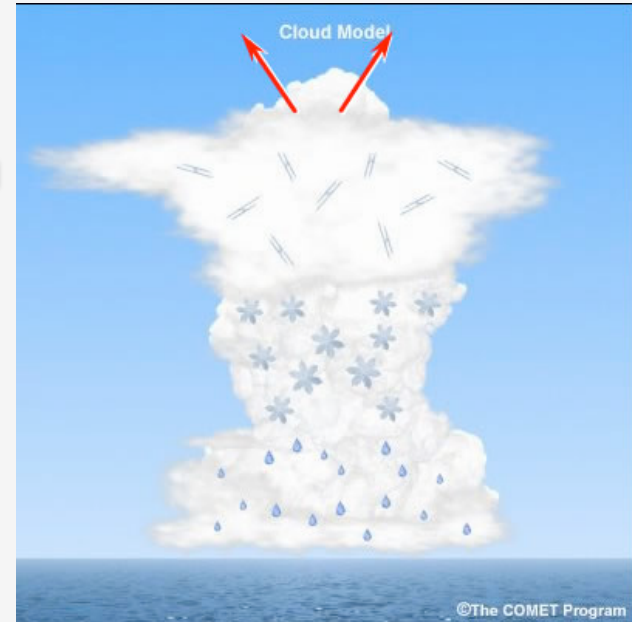


Precipitation Remote Sensing

Passive Remote Sensing: Inferred indirectly from emitted infrared radiation by clouds

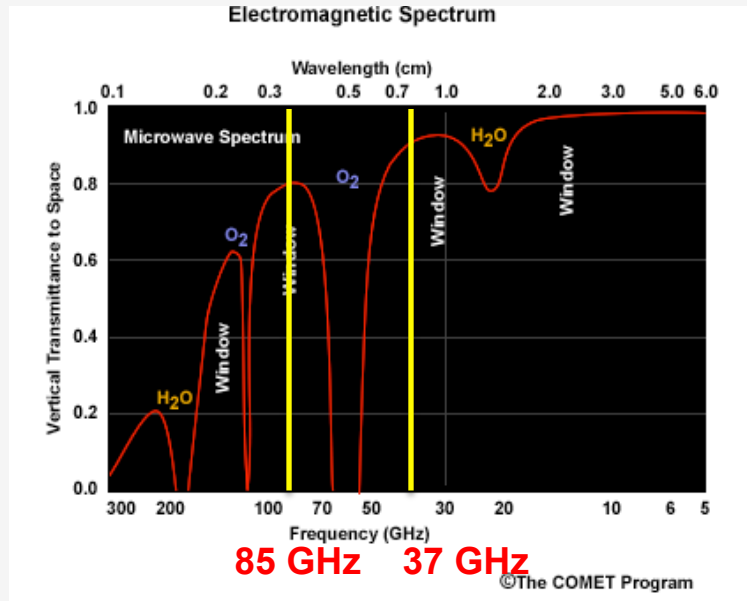


http://missionscience.nasa.gov/ems/09_visiblelight.html



Precipitation Remote Sensing

Passive Remote Sensing: Estimated from microwave radiation emitted or scattered by precipitation particles

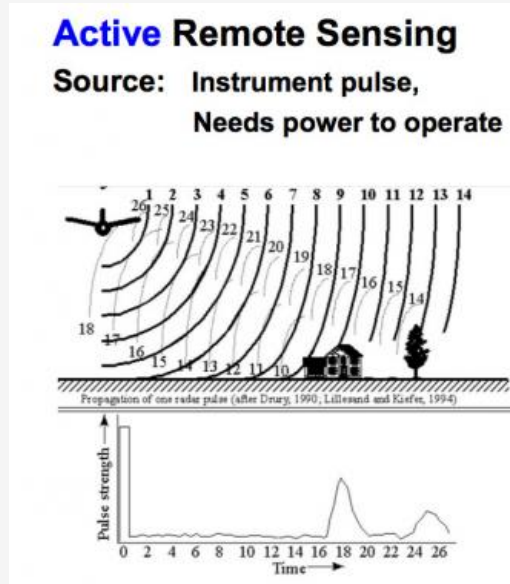


- The lower frequencies, referred to as “emissions channels” measure precipitation mainly from energy emitted by raindrops (37 GHz)
- The higher frequencies, or “scattering channels” gather energy scattered by ice particles above the freezing level (85 GHz)

<http://comet.ucar.edu>

Precipitation Remote Sensing

Active Remote Sensing: Estimated from back-scattered microwave radiation transmitted by radars



- NASA Satellites TRMM and GPM use K-band radar
- K-band generally has a frequency range within 27-40 GHz and 12-18 GHz



Global Precipitation Climatology Project (GPCP)

Global Precipitation Climatology Project (GPCP)

http://precip.gsfc.nasa.gov/gpcp_v2.2_comb_new.html

- Established by the World Climate Research Program (WCRP)
- Attached to the Global Energy and Water Exchange (GWEX) program
- Quantifies global rainfall from satellite measurements
- The longest satellite-based precipitation data record covering 30+ years from 1979-present

GPCP

http://precip.gsfc.nasa.gov/gpcp_v2.2_comb_new.html

GPCP combines precipitation information from several satellites and gauges to derive a merged data set using:

- The passive microwave estimates are based on the series of Defense Meteorological Satellite Program (DMSP)
 - Special Sensor Microwave/Imager (SSM/I)
 - Special Sensor Microwave Imager/Sounder (SSMIS) data
- The infrared (IR) precipitation estimates are based on
 - Geostationary satellites from U.S., Europe, and Japan
 - NOAA-series polar orbiting satellites:
 - Television Infrared Observation Satellite Program (TIROS), Operational Vertical Sounder (TOVS), NASA Aqua Satellite Atmospheric Infrared Sounder (AIRS)
 - Rain gauge data from the Global Precipitation Climatology Center (GPCC)

GPCP Sources and Techniques

Technique	Variable				
	Precip Rate [p]	Random Error [e]	Source	Number of Samples	
	(mm/d)	(mm/d)	[s]	[n]	(Units)
SSMI(SSMIS) Emission [se]	*			*	55 km images
SSMI(SSMIS) Scattering [ss]	*			*	overpass days
SSMI(SSMIS) Composite [sc]	*		*	*	55 km images
TOVS(AIRS) [tv]	*				
Merged SSMI(SSMIS)/TOVS(AIRS) [st]	*	*	*		
OPI [op]	*	*			
GPI [gp]	*			*	2.5° images
AGPI [ag]	*	*			
Multi-Satellite [ms]	*	*			
GPCC Gauge [ga]	*	*		*	gauges
Satellite-Gauge [sg]	*	*			

Final Product

GPCP Sources and Techniques

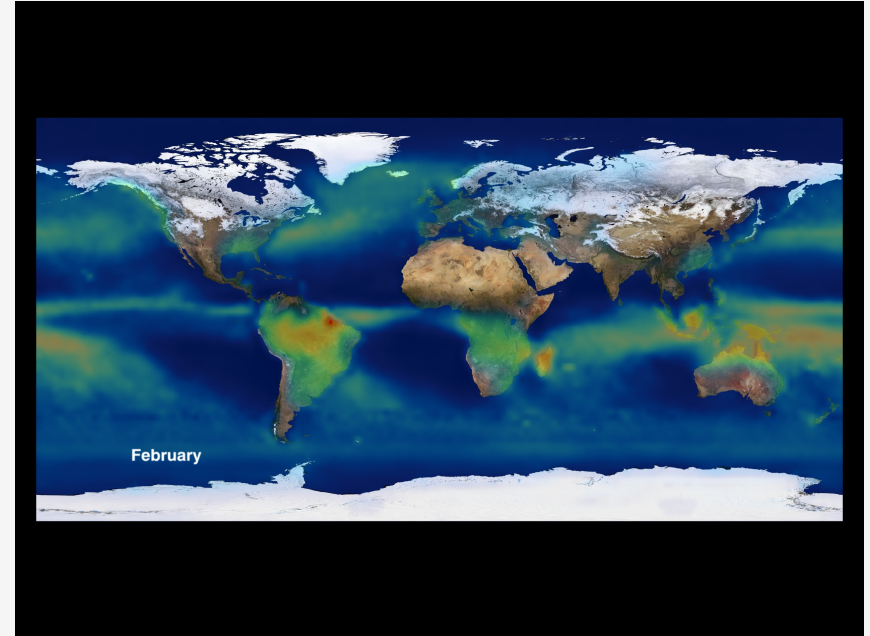
Technique
SSMI(SSMIS) Emission [se]
SSMI(SSMIS) Scattering [ss]
SSMI(SSMIS) Composite [sc]
TOVS(AIRS) [tv]
Merged SSMI(SSMIS)/TOVS(AIRS) [st]
OPI [op]
GPI [gp]
AGPI [ag]
Multi-Satellite [ms]
GPCC Gauge [ga]
Satellite-Gauge [sg]

- GPCP is based on a different mix of observations in space and time
- No microwave observations are available before 1986
- TOVS/AIRS from polar orbiting satellites provide infrared observations
- Geostationary infrared based GPI available only in 40°S – 40°N

GPCP Data Information

More information on GPCP data sources can be obtained from

- <http://precip.gsfc.nasa.gov>
- <https://pmm.nasa.gov/education/videos/nasa-scientists-research-global-precipitation>

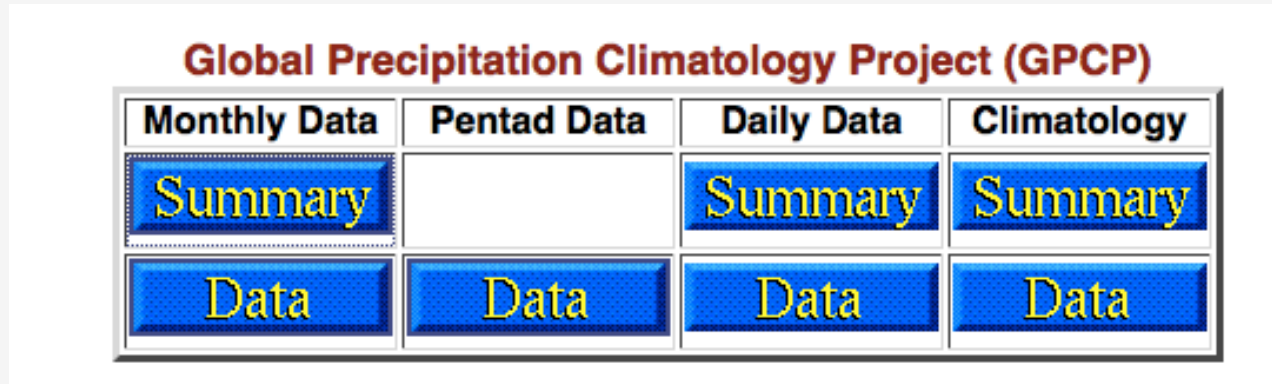


Average monthly rainfall for February from 1979-2006.
svs.gsfc.nasa.gov


GPCP Data Information

More information on GPCP data sources can be obtained from

- <http://precip.gsfc.nasa.gov>
- <https://pmm.nasa.gov/education/videos/nasa-scientists-research-global-precipitation>



GPCP Data Products

Product Name and Version	Spatial Resolution and Coverage	Temporal Resolution and Coverage	Data Format
GPCP Version 2.2	2.5° x 2.5° Global	5-day Mean Monthly (1979-2015) Climatology based on (1979-2011)	Binary with ASCII Header
GPCP Version 1.2	1° x 1° Global	Daily (10/1996-10/2015)	

Detailed
Documentation



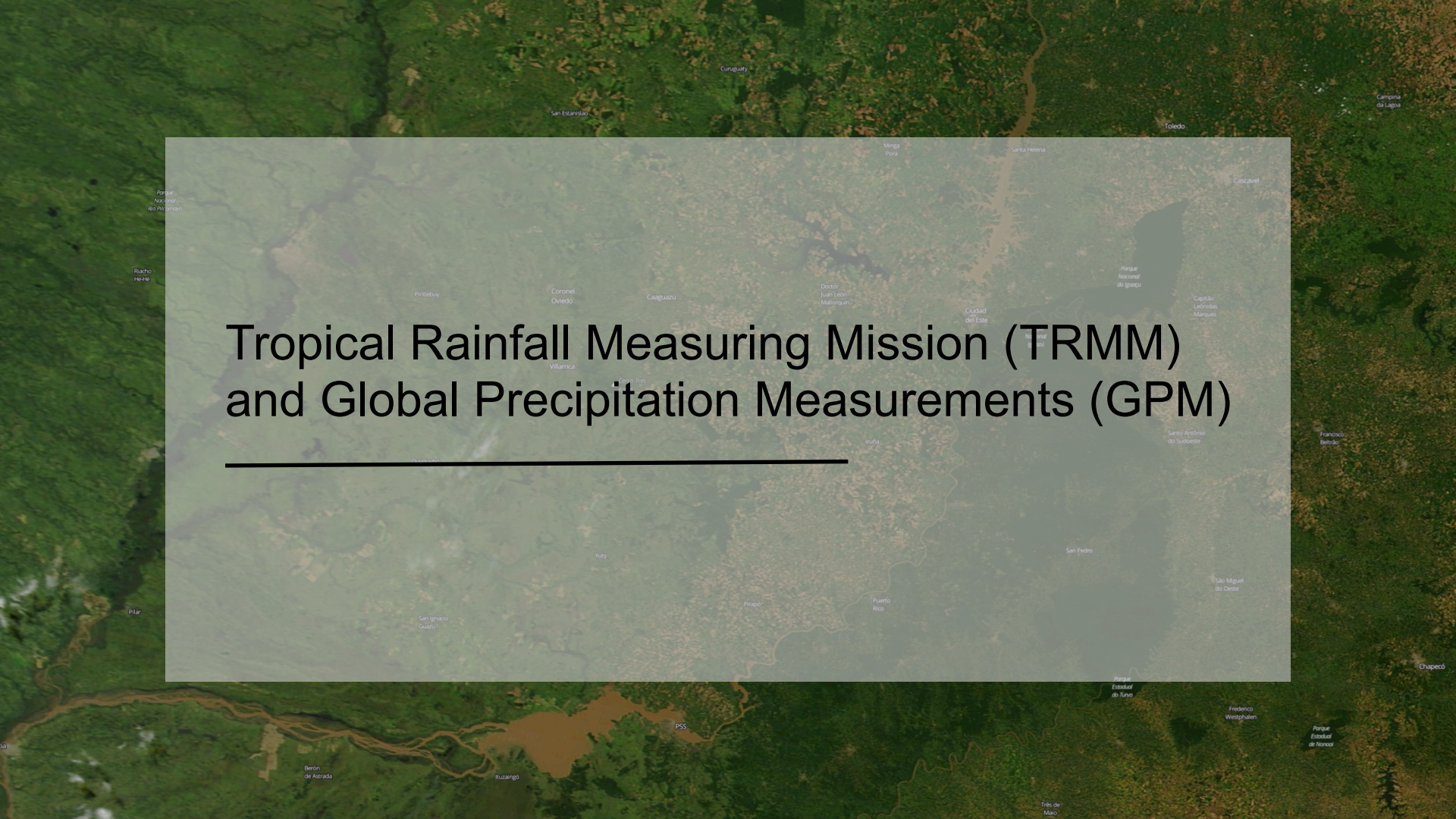
ftp://precip.gsfc.nasa.gov/pub/gpcp-v2.2/doc/V2.2_doc.pdf

ftp://meso.gsfc.nasa.gov/pub/1dd-v1.2/1DD_v1.2_doc.pdf

GPCP Data Access

Product Name and Version	Data Access File Name Convention
GPCP Version 2.2 Monthly	ftp://precip.gsfc.nasa.gov/pub/gpcp-v2.2/psg/ <ul style="list-style-type: none">• gpcp_v2.2_psg.YYYY.gz• gpcp_v2.2_esg.YYYY.gz (Error)
GPCP Version 2.2 Pentad	ftp://ftp.cpc.ncep.noaa.gov/precip/GPCP_PEN/ <ul style="list-style-type: none">• gpcp_pen_v2.2_sgi.YYYY.gz
GPCP Version 1.2	ftp://meso.gsfc.nasa.gov/pub/1dd-v1.2 <ul style="list-style-type: none">• gpcp_1dd_v1.2_p1d.YYYY.gz

psg: Precipitation Satellite – Gauge; pid: Precipitation 1 degree

An aerial photograph of a lush, green tropical landscape with a river and various geographical features. Overlaid on this is a semi-transparent map of a region, likely in Central America, showing cities, rivers, and national parks. The map overlay is centered and covers most of the image. The text is positioned in the center of the map overlay.

Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurements (GPM)

Tropical Rainfall Measurement Mission (TRMM)

<http://trmm.gsfc.nasa.gov>

- The first satellite dedicated to measuring tropical and subtropical rainfall
- Launched 27 November 1997 and ended 15 April 2015
- First satellite to carry a microwave precipitation radar
- Predecessor to Global Precipitation Measurement (GPM) Mission



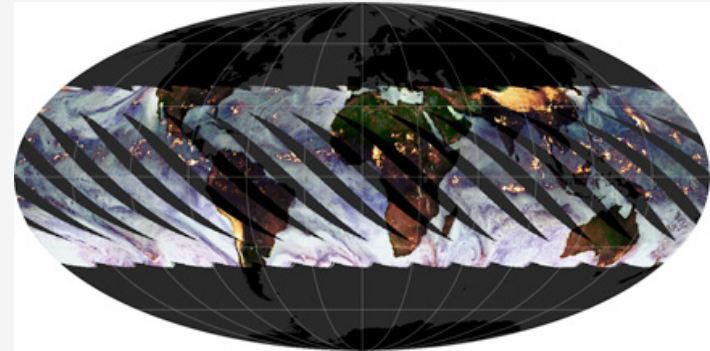
A joint mission between NASA and JAXA (Japanese Space Agency)

TRMM Satellite & Sensors

<http://trmm.gsfc.nasa.gov>

- In a non-polar, low-inclination orbit
- Altitude of approximately 350km, raised to 403km after Aug 23, 2001
- Spatial Coverage
 - 16 TRMM orbits a day covering global tropics between 35°S – 35°N latitude
- Sensors:
 - TMI (TRMM Microwave Imager)
 - PR (Precipitation Radar)
 - VIRS (Visible and Infrared Scanner)
 - LIS (Lightening Imaging Sensor)
 - CERES (Clouds and the Earth's Radiant Energy System)

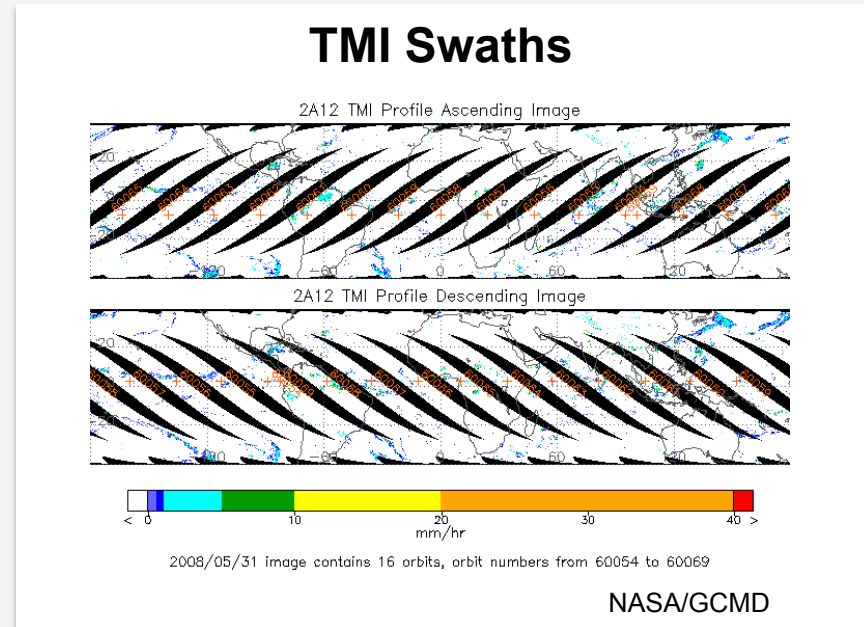
TRMM Orbits



TRMM Microwave Imager (TMI)

<http://pmm.nasa.gov/TRMM/TMI>

- Spatial Coverage and Resolution:
 - Coverage: -180° - 180° , 35° S- 35° N
 - Swath: 760km (878km after 8/2001)
 - Vertical Resolution:
 - 0.5 km from surface – 4 km
 - 1.0 km from 4-6 km
 - 2.0 km from 6-10 km
 - 4.0 km from 10-18 km
- Temporal Coverage and Resolution:
 - Nov 27, 1988 Apr 15, 2014
 - 16 orbits per day



Channel Frequencies

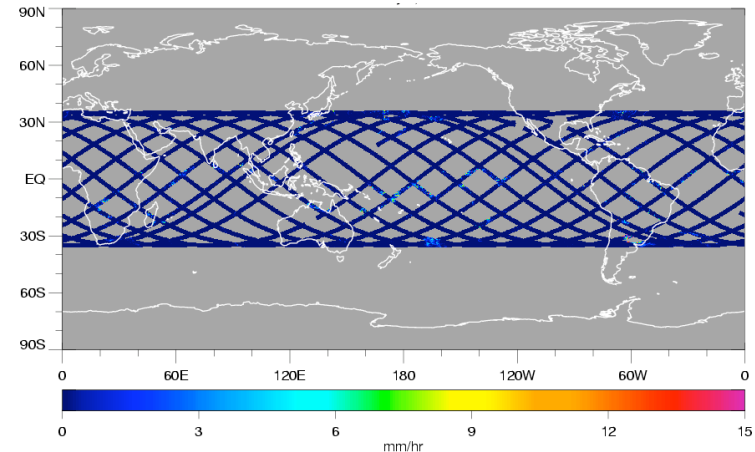
- 10.7, 19.4, 21.3, 37, 85.5 GHz

Precipitation Radar (PR)

<http://pmm.nasa.gov/TRMM/PR>

- Spatial Coverage and Resolution:
 - Coverage: 35°S-35°N
 - Swath: 215km (247 after 8/2001)
 - Spatial Resolution: 4.3km (5km)
 - Vertical Resolution: 250m (from 0-20km)
- Temporal Coverage and Resolution:
 - Nov 27, 1998 – Oct 7, 2014
 - ~16 orbits per day
- Frequency:
 - 13.6 GHz

PR Swaths

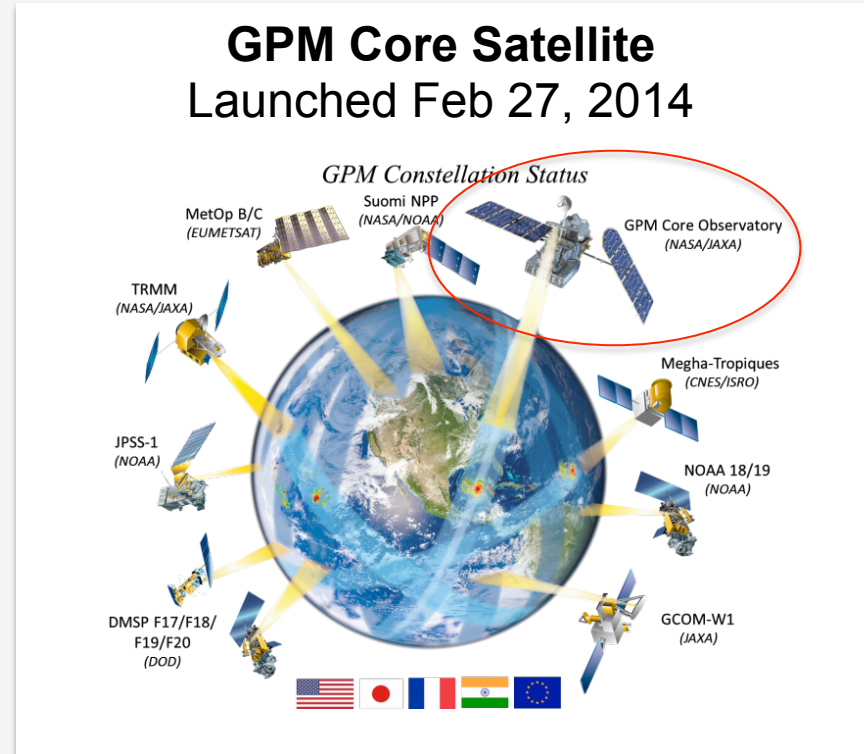


Kummerow, C., et. al, 1998: The tropical rainfall measuring mission (TRMM) sensor package, J. Atmos. Oceanic Technol., 15, 809-817.

GPM Satellite & Sensors

<http://pmm.nasa.gov/GPM>

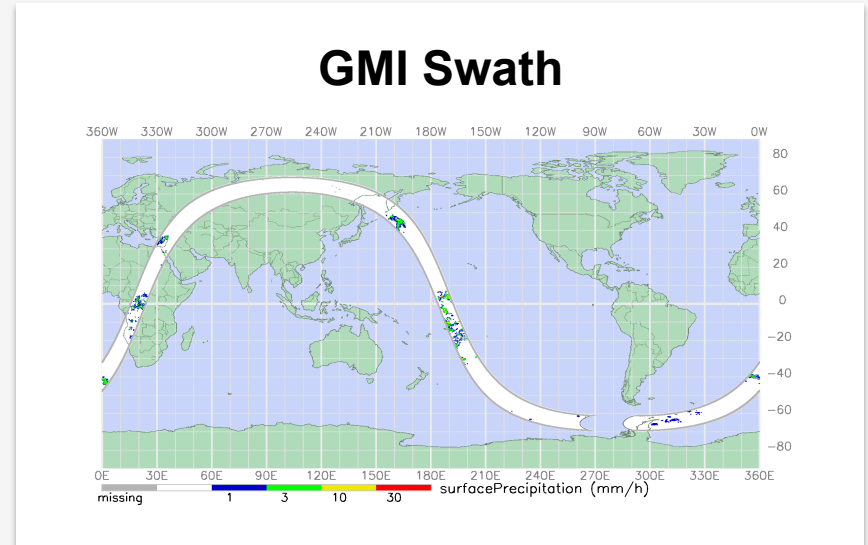
- GPM core satellite is in a non-polar, low inclination orbit
 - Altitude: 407km
- Spatial Coverage:
 - 16 T orbits a day covering global tropics, between 65°S-65°N
- Along with constellation of satellites, GPM has revisit time of 1-2 hrs over land
- Sensors:
 - GMI (GPM Microwave Imager)
 - DPR (Dual Frequency Precipitation Radar)



GPM Microwave Imager (GMI)

<http://pmm.nasa.gov/GPM/flight-project/GMI>

- Spatial Coverage and Resolution:
 - Coverage: -180°-180°, 65°S-65°N
 - Swath: 885km
 - Spatial Resolution: 4.4-32km
 - Vertical Resolution:
 - 0.5 km from surface – 4 km
 - 1.0 km from 4-6 km
 - 2.0 km from 6-10 km
 - 4.0 km from 10-18 km
- Temporal Coverage and Resolution:
 - Feb 2014 – present
 - ~2-4 hr observations



Channel Frequencies:

- 10.6, 18.7, 23.8, 36.5, 89, 166, 183 GHz

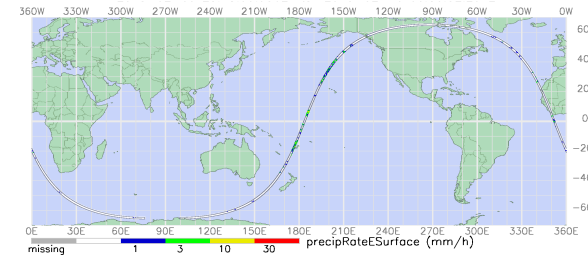
Dual Precipitation Radar (DPR)

<http://pmm.nasa.gov/GPM/flight-project/DPR>

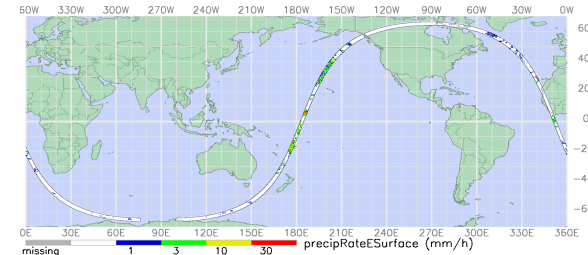
- Spatial Coverage and Resolution:
 - Coverage: -180° - 180° , 65° S- 65° N
 - Swath: 120km (Ka) and 245km (Ku)
 - Spatial Resolution: 5.2km
 - Vertical Resolution: 250m (from 0-20km)
- Temporal Coverage and Resolution:
 - Feb 27, 2014 – present
 - ~2-4 hr observations
- Frequency:
 - 13.6 and 35.5 GHz

DPR Swaths

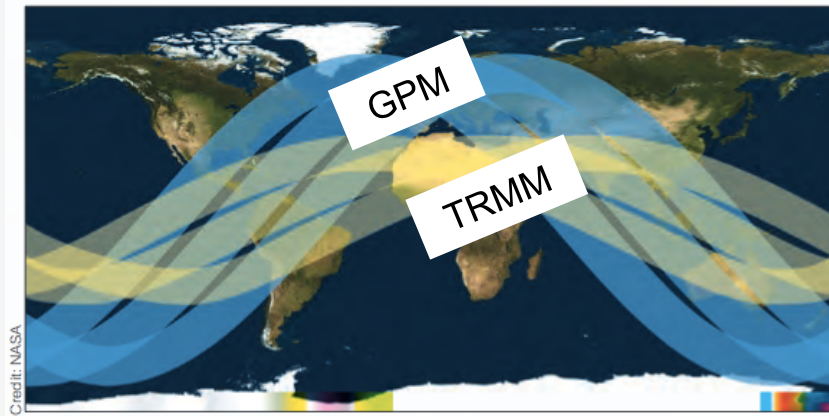
Ka 35.5 GHz



Ku 13.6 GHz




TRMM and GPM Comparison



- TRMM measurements are limited to the tropics
- GPM measurements span middle & high latitudes

- GMI & DPR
 - provide improved reference standards for inter-calibration of constellation precipitation measurements
 - Better accuracy measurements
- GMI has a higher spatial resolution than TMI
- Improved light rain and snow detection in GMP
- DPR has better identification of liquid, ice, mixed-phase precipitation particles



TRMM and GPM Data Products

Importance of TRMM Data Products

TRMM has ended, but it's important to learn about TRMM data because:

- TRMM provides high resolution precipitation data for 17 years
 - Useful for detecting and understanding climate variability and change
- Many applications are developed from TRMM data and still have to transition to using GPM data
 - extreme rain, flood, and drought monitoring and mapping
 - Agriculture
 - Health
- GPM algorithms are conceptually similar
 - TRMM and GPM data will be inter-calibrated to provide a combined long-term precipitation record

Precipitation Algorithms for TRMM and GPM

<http://pmm.nasa.gov/science/precipitation-algorithms>

- There are 4 major algorithms used to obtain precipitation estimates from GPM/TRMM observations
 - Radar Algorithms
 - Radiometer Algorithms
 - Combined Radar + Radiometer Algorithms
 - Multi-Satellite Algorithms
 - TRMM and GPM Core are used as a calibrator for multiple national and international constellation satellites

Summary of TRMM Level-2 Precipitation Products

Sensor/Product Name	Spatial Resolution & Coverage	Temporal Resolution	Data Format
PR only: 2A25	<ul style="list-style-type: none">• 5km x 5km• Single orbit• 16 orbits/day (35°S-35°N)	<ul style="list-style-type: none">• 7-day latency for Near Real-Time• 3-hour, 2-day, 5-day	HDF4
TMI only: 2A12	<ul style="list-style-type: none">• 5km x 5km• Orbital• 16 orbits/day (38°S-38°N)	<ul style="list-style-type: none">• 3-hour, 2-day, 15-day	
Combined TMI & PR: 2B31	<ul style="list-style-type: none">• 5km x 5km• Orbital• 16 orbits/day (38°S-38°N)	<ul style="list-style-type: none">• 7-day latency for Near Real-Time• 3-hour, 2-day, 5-day	

Summary of TRMM Level-3 Precipitation Products

Sensor/Product Name	Spatial Resolution & Coverage	Temporal Resolution	Data Format
TMPA: 3B42RT & Final 3B42	<ul style="list-style-type: none"> • 0.25° x 0.25° • 50°S x 50°N 	<ul style="list-style-type: none"> • RT is NRT with 8 hr latency • 3-hourly 	<ul style="list-style-type: none"> • RT data in binary and OpenDAP
TMPA: 3B43		<ul style="list-style-type: none"> • Monthly • 2 month latency 	<ul style="list-style-type: none"> • HDF4 • NetCDF
PR only: 3A12	<ul style="list-style-type: none"> • 0.5° x 0.5° and 5° x 5° • 37°S x 37°N 	<ul style="list-style-type: none"> • Monthly 	<ul style="list-style-type: none"> • HDF4 • OpenDAP
TMI only: 3A12	<ul style="list-style-type: none"> • 0.5° x 0.5° • 38°S x 38°N 	<ul style="list-style-type: none"> • Monthly 	
TMI-PR Combined: 3B31	<ul style="list-style-type: none"> • 5° x 5° • 40°S x 40°N 	<ul style="list-style-type: none"> • Monthly 	

Summary of GPM Level-2 Precipitation Products

Sensor/Product Name	Spatial Resolution & Coverage	Temporal Resolution	Data Format
DPR Ku-only: 2A-Ku	<ul style="list-style-type: none"> • 5.2km x 125m • Single orbit • 16 orbits/day (70°S-70°N) 	<ul style="list-style-type: none"> • 20-120 minutes • 24 hrs 	<ul style="list-style-type: none"> • HDF5 • OpenDAP
DPR Ka-only: 2A-Ka			
DPR Ku & Ka: 2A-DPR			
GMI/2A-GPROF	<ul style="list-style-type: none"> • 4km x 4km • Orbital • 16 orbits/day (70°S-70°N) 	<ul style="list-style-type: none"> • 2-40 hrs 	
Combined GMI+DPR: 2A-CMB	<ul style="list-style-type: none"> • 5km x 5km • Orbital (70°S-70°N) • Coincident Ku-Ka GMI footprints 	<ul style="list-style-type: none"> • 3-40 hrs 	

Summary of GPM Level-3 Precipitation Products

Sensor/Product Name	Spatial Resolution & Coverage	Temporal Resolution	Data Format
IMERG	<ul style="list-style-type: none"> • 0.1° x 0.1° • 90°S-90°N 	<ul style="list-style-type: none"> • 30 min (NRT) • 6 hr, 16 hr, & 3 month latency 	<ul style="list-style-type: none"> • HDF4 • NetCDF • OpenDAP • ASCII • .gif, .png • KML (Google Earth)
Combined GMI + DPR Rainfall Averages: 3-CMB	<ul style="list-style-type: none"> • 0.1° x 0.1° • 70°S-70°N 	<ul style="list-style-type: none"> • Monthly 	
DPR Rainfall Averages: 3-DPR	<ul style="list-style-type: none"> • 0.25° x 0.25° • 5.0° x 5.0° • Daily: 67°S-67°N • Monthly: 70°S-70°N 	<ul style="list-style-type: none"> • Daily & Monthly 	
GMI Rainfall Averages: 3-GPROF	<ul style="list-style-type: none"> • 0.25° x 0.25° • 90°S-90°N 	<ul style="list-style-type: none"> • Daily & Monthly 	

Multi-Satellite Algorithms for TRMM and GPM

<http://pmm.nasa.gov/science/precipitation-algorithms>

- TRMM & GPM Core satellites are used to calibrate microwave observations from a constellation of national and international satellites
- Allow improved spatial and temporal coverage of precipitation data
- TRMM Multi-satellite Precipitation Analysis (**TMPA**)
 - Widely used for applications
- TMPA will be extended to match Integrated Multi-satellitE Retrievals for GPM (**IMERG**)

TMPA

http://precip.gsfc.nasa.gov/trmm_comb.html

- TMPA combines PR & TMI rain rates
- Inter-calibrates passive rain rates from other satellite sensors
 - TMI, SSM/I, AMSR, AMSU-B, MHS, IR radiometers*
- Inter-calibrates with national and international geostationary and NOAA low-earth orbiting satellites infrared measurements by using VIRS
- Final rain product is calibrated with rain gauge analyses on a monthly time scale

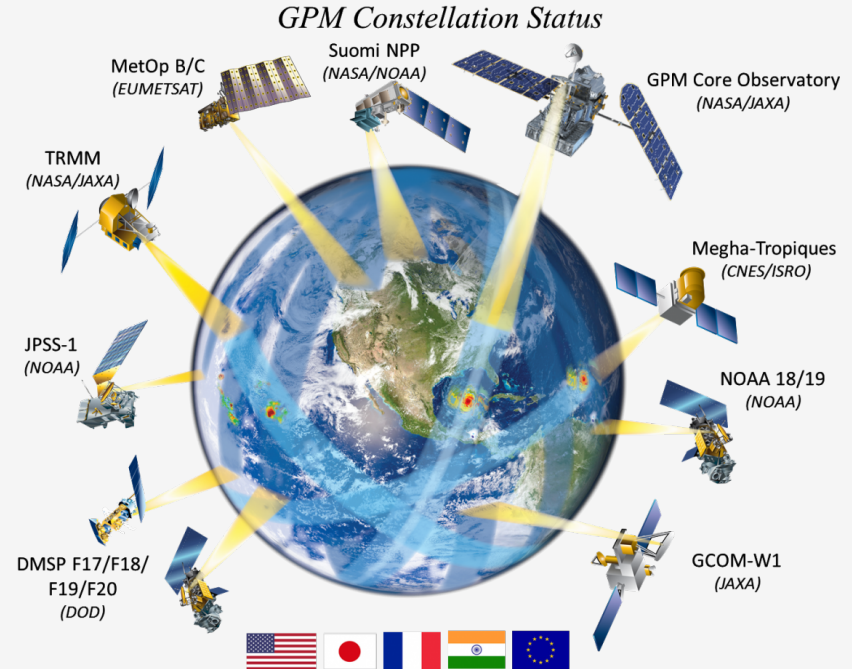
*

- AMSR: Advanced Microwave Scanning Radiometer – onboard NASA Aqua Satellite
- AMSU: Advanced Microwave Sounding Unit – onboard NOAA operational satellite

IMERG

https://pmm.nasa.gov/sites/default/files/document_files/IMERG_ATBD_V4.5.pdf

- Conceptually similar to TMPA
- GPM constellation satellites include:
 - GCOM-W
 - DMSP
 - Megha-Tropiques
 - MetOp-B
 - NOAA-N'
 - NPP
 - NPOESS
- Final rain product is calibrated with rain gauge analyses on monthly time scale



pmm.nasa.gov

IMERG

https://pmm.nasa.gov/sites/default/files/document_files/IMERG_ATBD_V4.5.pdf

- **Multiple runs accommodate different user requirements for latency and accuracy**
 - “Early” – now 5 hours (flash flooding) – will be 4 hours
 - “Late” – now 15 hours (crop forecasting) – will be 12 hours
 - “Final” – 3 months (research data)
- **Native time intervals are half-hourly and monthly (final only)**
 - Value-added products at 3 hrs, 1, 3, and 7 days - .tiff will be available
 - Initial release covers 60°N-60°S – will be 90°N-90°S

TMPA and IMERG

	TMPA	IMERG
Spatial Resolution	0.25° x 0.25°	0.1°x0.1°
Spatial Coverage	Global, 50°S-50°N	Global, 60°S-60°N (will be extended from pole-pole)
Temporal Resolution	3 hours	30 minutes
Temporal Coverage	12/1997 – Present*	2/27/2014-Present ⁺

⁺ TMPA and IMERG combined data will be available in late 2017 at IMERG data resolution

* After 15 April 2015 TRMM climatological calibration is being used to generate TMPA

TRMM and GPM Data Type Convention

<http://pps.gsfc.nasa.gov/Documents/FileNamingConventionForPrecipitationProductsForGPMMissionV1.4.pdf>

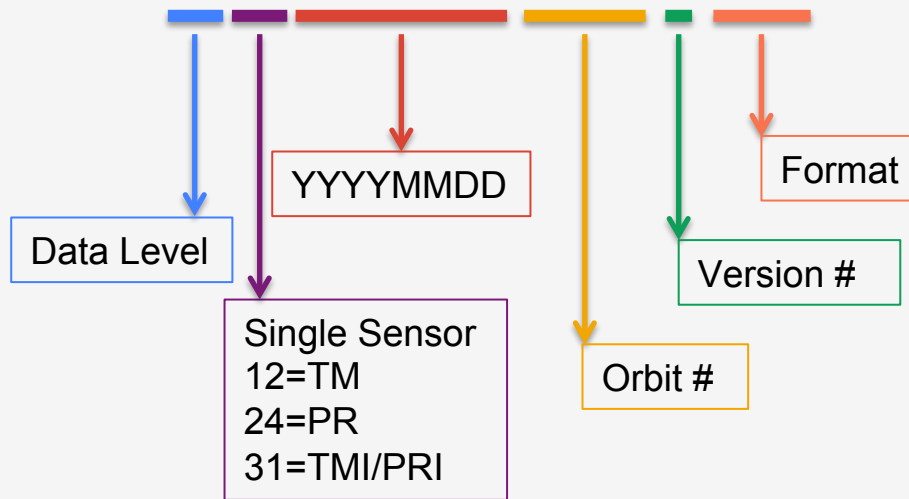
Type	Description
1A	Instrument count, geolocated, at instantaneous field of view (IFOV).
1B	Geolocated, calibrated T_b or radar power at IFOV.
1C	Intercalibrated brightness temperatures T_c at IFOV.
2A	Geolocated geophysical parameters at IFOV from a single instrument.
2B	Geolocated geophysical parameters at IFOV from multiple instruments.
3A	Space/time averaged geophysical parameters from a single instrument.
3B	Space/time averaged geophysical parameters from multiple instruments.
4	Combined satellite, ground and/or model data.

TRMM File Name Convention

<http://pps.gsfc.nasa.gov/Documents/FileNamingConventionForPrecipitationProductsForGPMMissionV1.4.pdf>

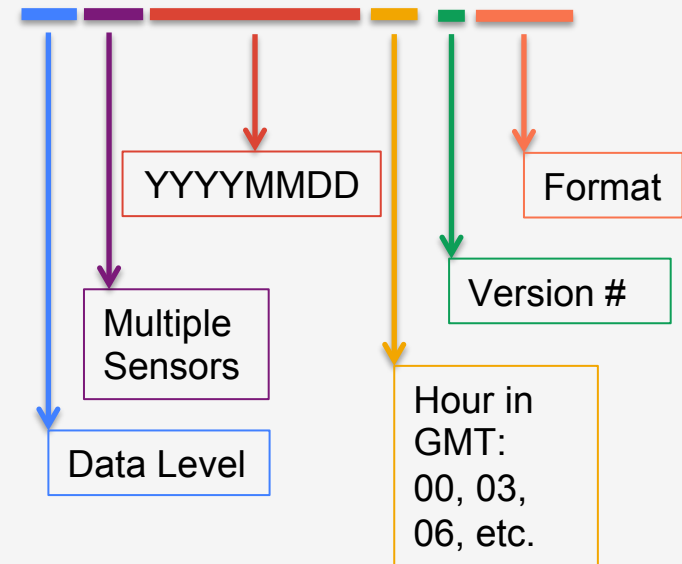
Level 2 File Name

2A12.20150408.99100.7.HDF



Level 3 File Name

3B42.19980102.00.7.HDF

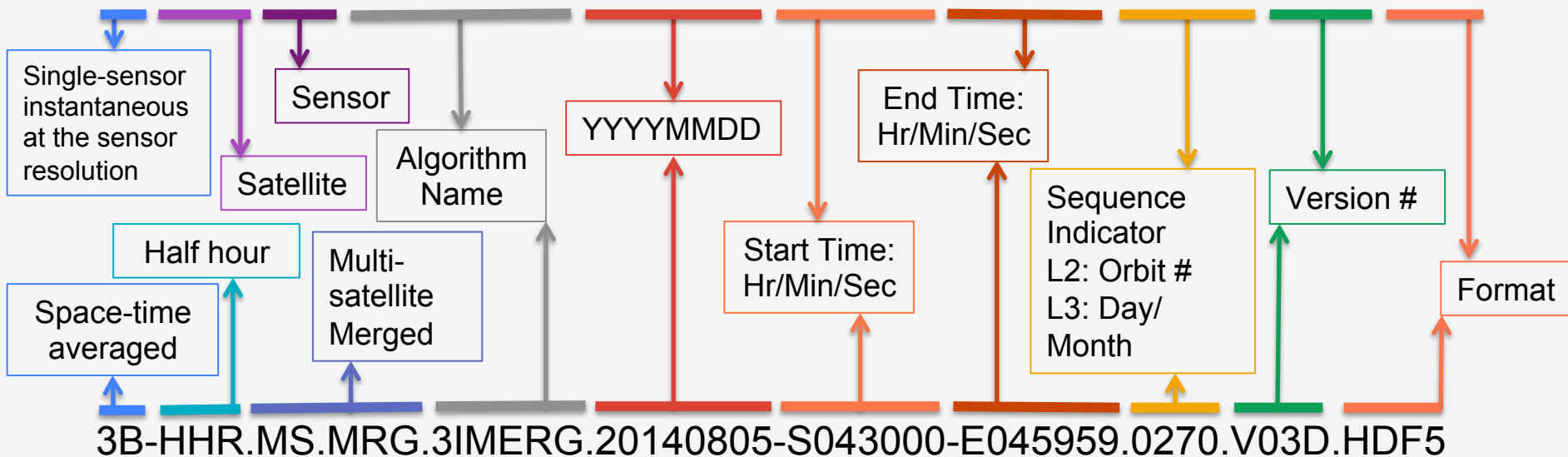


GPM File Name Convention

<http://pps.gsfc.nasa.gov/Documents/FileNamingConventionForPrecipitationProductsForGPMMissionV1.4.pdf>

Level 2 File Name

2A.GPM.GMI.GPROF2008.20131101-S235152-E012400.000352.V03C.HDF5



Level 3 File Name

Trade-Offs Between Level 2 and Level 3 Precipitation Data Products

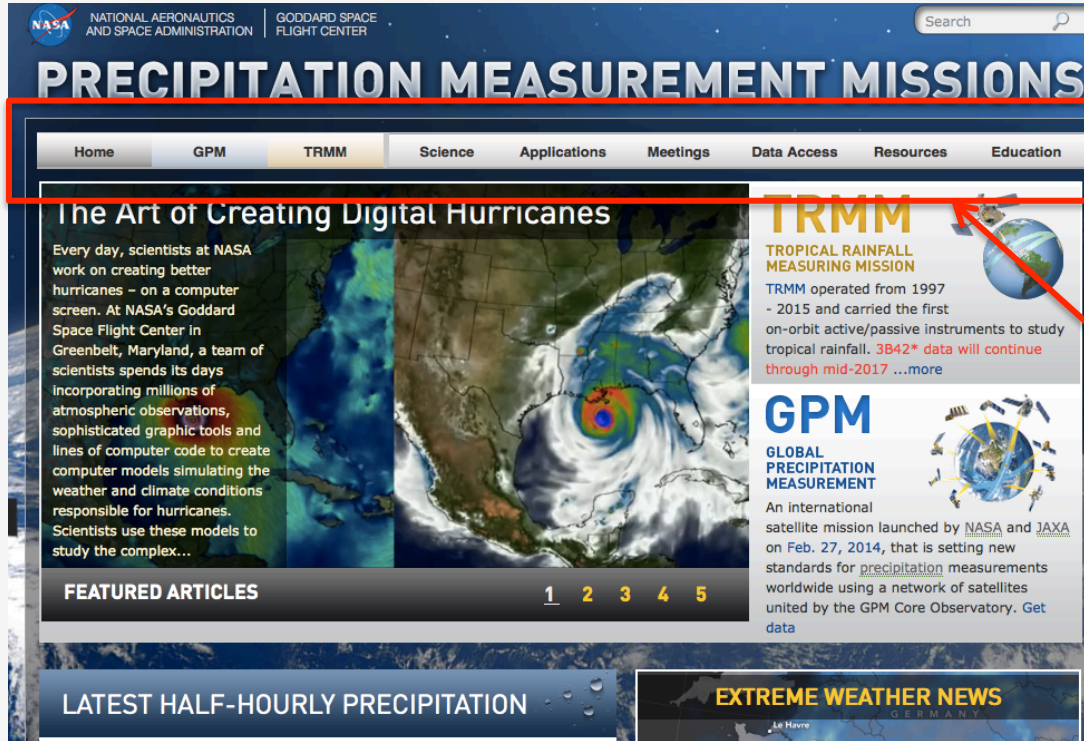
- IMERG and TMPA have lower spatial resolutions than Level 2 data
 - E.g. 2A12, 2A25, 2B31, 2A-GPROF, 2A-2DPR, 2BCMB
- IMERG and TMPA have better spatial coverage with no orbit gaps compared to Level 2 and Level 3 radar, imager, and radar/imager combined data
- IMERG and TMPA:
 - are uniformly gridded
 - have uniform with temporal resolution to cover diurnal variations
 - are available in multiple formats

An aerial photograph of a tropical landscape, likely in Central America, showing dense green forests, a winding river, and several small towns. A semi-transparent rectangular box is overlaid in the center of the image, containing the title text. The background map includes labels for various locations such as San Estanislao, Comaguary, Toledo, Cancun, and others.

TRMM/GPM Data Access: Demonstration of Precipitation Processing System/STORM

Precipitation Measurement Missions

<https://pmm.nasa.gov/>



- Home of all information related to TRMM and GPM
- Links to data documentation and access

Precipitation Measurement Missions: Data Access

<https://pmm.nasa.gov/data-access>

Data Access

- Extreme Weather News
- Data Downloads & Documentation
 - TRMM
 - GPM
 - Ground Validation
- Data Sources
- Data Recipes
- Data News
- Google Earth
- NASA Worldview
- Using the PPS FTP
- Training
- Data FAQ

Connect With Us

- Twitter
- Facebook
- YouTube

Need Help?

- View Frequently Asked Questions
- View the PMM Glossary

How to Access TRMM & GPM Precipitation Data

Precipitation data from the GPM and TRMM missions is made available free to the public in a variety of formats from several sources at NASA Goddard Space Flight Center. This section outlines the different types of data available, the levels of processing, the sources to download the data, and some helpful tips for utilizing precipitation data in your research.

- **GPM Data Downloads & Documentation**
- TRMM Data Downloads & Documentation
- Explanation of GPM & TRMM Data Sources
- Data Processing "Recipes"
- Precipitation Data in Google Earth
- Frequency Asked Questions (FAQ)

GET DATA
GLOBAL PRECIPITATION MEASUREMENT

New Users Start Here

Use of the **PPS FTP** and **STORM** requires you to first register your email address. [Click here to register.](#)

- All about TRMM and GPM data
 - Including updates, news, and FAQ
- Quick data access links and user registration

Precipitation Measurement Missions: Data Sources

<https://pmm.nasa.gov/data-access/data-sources>

PRECIPITATION MEASUREMENT MISSIONS

Home | GPM | **TRMM** | Science | Applications | Meetings | Data Access | Resources | Education

Data Access

- Extreme Weather News
- ▼ Data Downloads & Documentation
 - TRMM
 - GPM
 - Ground Validation
- Data Sources**
- Data Recipes
- Data News
- Google Earth
- NASA Worldview
- Using the PPS FTP
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- Data FAQ

Connect With Us

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Data Sources

This section outlines the primary sources for downloading GPM and TRMM precipitation data from archive sites at Goddard Space Flight Center, including basic instructions for using each source.

NOTE: Use of the PPS FTP and STORM requires you to first register your email address. [Click here to register.](#)

- FTP (PPS)
- **STORM**
- Mirador
- Giovanni (GES DISC)
- OPeNDAP
- FTP (GES DISC)
- GrADS Data Server (GDS)
- GPM Ground Validation Data Portal

QUICK DATA LINKS

- [TRMM Downloads](#)
- [GPM Downloads](#)
- [Precipitation Processing System \(PPS\) Home](#)
- [GES DISC Home](#)
- [Giovanni TOVAS Data Viewer](#)

KEYWORDS

[data](#)
[GPM](#)
[TRMM](#)
[downloads](#)
[PMM Science Team](#)

Precipitation Processing System (PPS) FTP

Precipitation Processing System: STORM

<https://storm.pps.eosdis.nasa.gov/storm/>

PPS is currently undergoing transition from GPM V03 to V04. Certain products and orders may be delayed or temporarily unavailable during this period. For updates on transition progress, click [here](#). Update 6/16/16: PPS has begun reprocessing of V04A Level 2-3 GPROF SSMIS and AMSR2 climatology products. Reprocessing will start with March 1, 2014 data.

PPS Data Access - to search for GPM and TRMM data, order custom subsets and set up subscriptions.

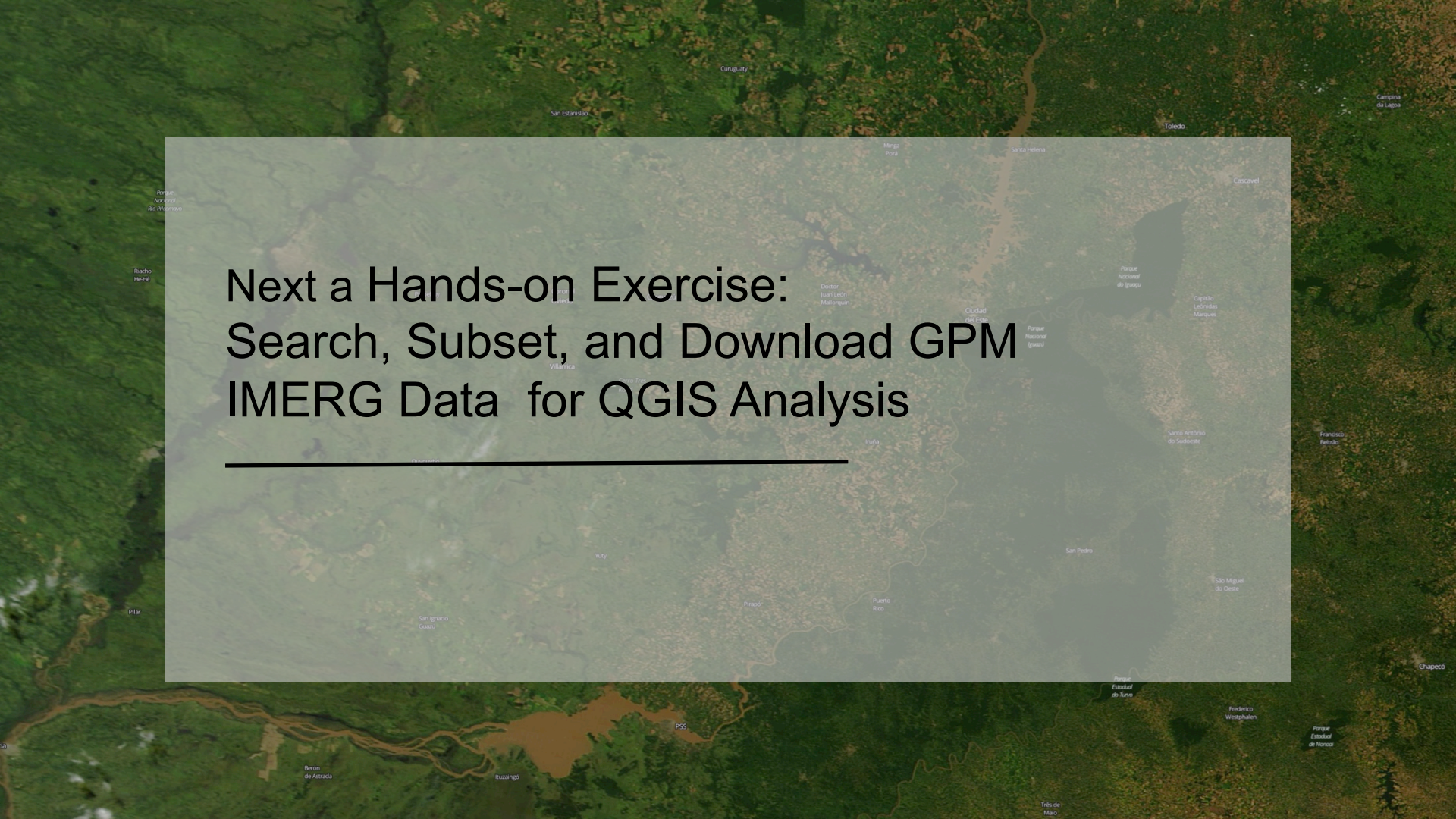
PPS Public Archive - to access GPM and TRMM standard products via online ftp.

These are the products available to the public. To retrieve data go to [PPS Data Access](#) or [PPS Public Archive](#).

Data Type	Algorithm	Satellite	Instrument	Primary Content
1A	1A01	TRMM	VIRS	Counts
1A	1A11	TRMM	TMI	Counts
1A	1A21	TRMM	PR	Counts
1A	1AGMI	GPM	GMI	Counts
1B	1B01	TRMM	VIRS	Radiance
1B	1B11	TRMM	TMI	Brightness Temperature
1B	1B21	TRMM	PR	Radar Power
1B	1BGMI	GPM	GMI	Brightness Temperature
1B	1BKa	GPM	DPR_KA	Radar Power
1B	1BKu	GPM	DPR_KU	Radar Power
1C	1C21	TRMM	PR	Reflectivity
1C	1CAMSR2	GCOMW1	AMSR2	Brightness Temperature
1C	1CATMS	INPP	ATMS	Brightness Temperature

- All TRMM and GPM data products can be downloaded from STORM
- Data images and HDF5 data viewer are available in STORM

**STORM
Demonstration!**

A satellite map of a tropical region, likely in Central America, showing dense green forest, rivers, and some cleared areas. A semi-transparent white rectangular box is overlaid on the map, containing the main text. The text is in a large, black, sans-serif font. Below the text is a solid black horizontal line. Various place names are visible on the map, including San Estanislao, Comusaty, Toledo, Cancun, Parque Nacional de Iguala, Ciudad del Lago, Parque Nacional Iguala, Doctor Juan León Mole, Villavieja, Yutzy, San Ignacio Quezón, Piragón, Puerto Rico, San Pedro, Santo Domingo de Guzmán, San Miguel de los Baños, Francisco Beltrán, Chaparral, Parque Estación de Turpo, Francisco Westphalen, Parque Estación de Turpo, Trío de Maio, Berón de Astrada, Ruzangó, and PSS.

Next a Hands-on Exercise: Search, Subset, and Download GPM IMERG Data for QGIS Analysis

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